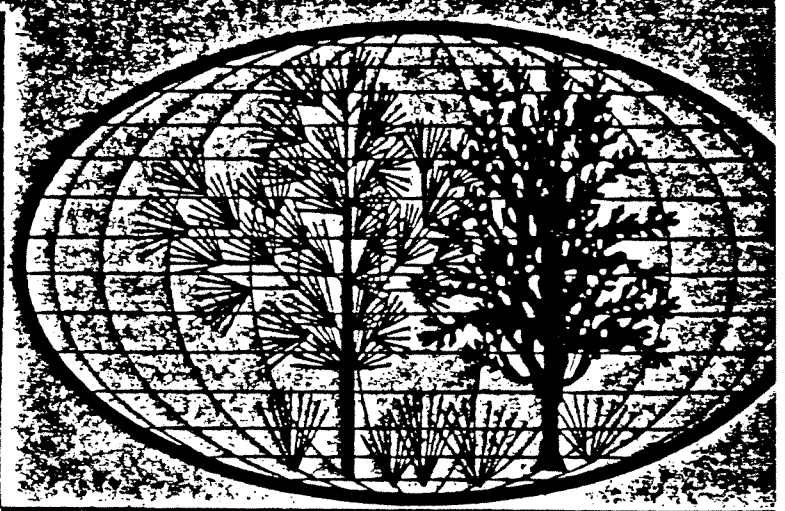
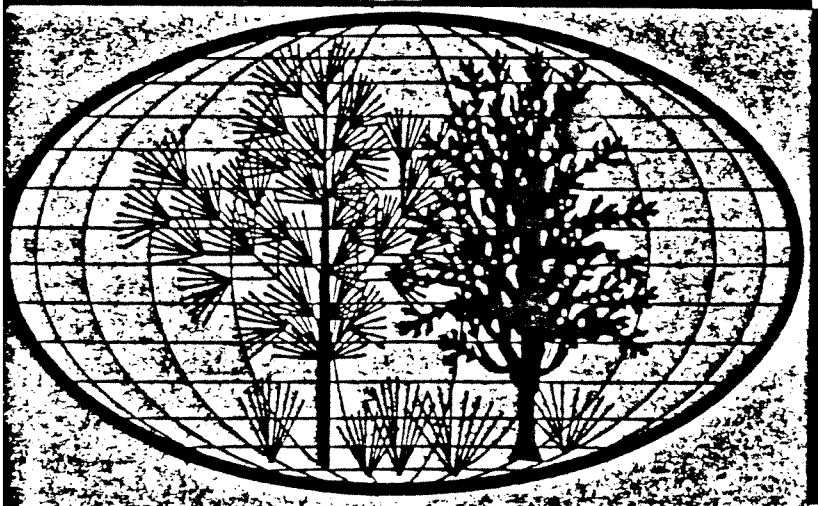
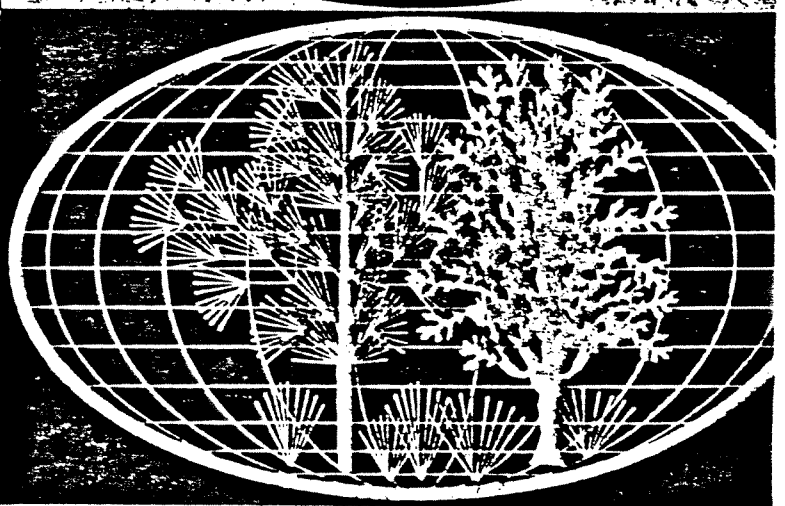
INTERNATIONAL CONFERENCE ON FOREST VEGETATION MANAGEMENT

Ecology, Practices and Policy







APRIL 27 - MAY 1, 1992

AUBURN UNIVERSITY

AUBURN, ALABAMA USA

PROCEEDINGS - VOLUME II

SCHOOL OF FORESTRY REPORT 1993:1

PROCEEDINGS OF THE INTERNATIONAL CONFERENCE ON FOREST VEGETATION MANAGEMENT

ECOLOGY, PRACTICE AND POLICY

APRIL 27 - MAY 1, 1992

AUBURN, ALABAMA, U.S.A.

Cosponsored By

School of Forestry
Alabama Agricultural Experiment Station
Auburn University

and

International Union of Forestry Research Organizations
Subject Group P1.13-00 Forest Weed Management

Auburn University
School of Forestry Report 1993:1
E.F. Thompson, Dean

Dean H. Gjerstad, Editor

Wiregrass cover following site preparation of sandhills

KENNETH W. OUTCALT
USDA Forest Service, Southeastern Forest Exp. Sta.
P. O. Box 14524, Gainesville, FL 32604

Wiregrass (*Aristida stricta* Michx.) is a keystone species in the longleaf pine (*Pinus palustris* Mill.) community of the southeastern Coastal Plain, USA, providing the fuel for recurring ground fires. This survey assessed the impact to wiregrass cover of different site preparation techniques. All sandhills sites regenerated to longleaf pine in the past 5 years on the Ocala National Forest, Florida were sampled. Hexazinone applied at rates up to 2 kg/ha, did not adversely impact wiregrass cover on sandhills sites. Areas treated with hexazinone and a double drum chopper had about half the wiregrass cover found on untreated or hexazinone only areas. In an operational comparison of Garlon with single chopping, single chopping treatments had less than one third the wiregrass cover found on herbicide treated areas. Double chopped sites averaged less than 2 percent wiregrass cover. Thus, herbicide treatments appear superior to chopping for reducing woody competition while maintaining wiregrass in sandhills longleaf communities. If chopping is used, it should be a single chop plus a herbicide rather than double chopping.

Introduction

Wiregrass or pineland threeawn (*Aristida stricta* Michx.) is a major understory species in the slash pine (*Pinus elliottii* Engelm.), South Florida slash pine (*P. elliottii* var. *densa* Little and Dorman), longleaf pine (*P. palustris* Mill.) - slash pine, longleaf pine, and longleaf pine - scrub oak types of the Atlantic coastal plain (Eyre 1980). It is most prevalent on infertile sands ranging from poorly-drained soils, typified by the Leon series (sandy, siliceous, thermic, Aeric Haplaquod) to excessively-drained soils like Lakeland (thermic, coated Typic Quartzipsamment). Pine - wiregrass communities once covered more than 10 million ha, from North Carolina to Florida (Southern Section SRM 1974). Although the overstory was southern pines, wiregrass was a critical component of the ecosystem. Fire was a frequent natural occurrence across much of the area, maintaining the pine - wiregrass communities (Christensen 1981). The accumulation of dead wiregrass furnished the fuel necessary to carry these ground fires. Thus, wiregrass significantly influenced the natural fire regime and thereby the plant community (Clewell 1989). Some land managers have recognized wiregrass as an important fuel source for prescribed fires (Christensen 1981). These fires reduce the risk of damaging wildfires and control the invasion of pine - wiregrass areas by hardwood species (Komarek 1977). In longleaf pine stands fires also control brown spot needle blight (*Scirrhia acicola* (Dearn.) Siggers), which can severely limit growth and survival of seedlings (Boyer 1975). In addition, the understory of wiregrass maintains a more favorable soil environment by improving soil structure and water and nutrient holding capacity (Snedaker and Lugo 1972).

Its ability to develop a dense root mat just below the soil surface makes wiregrass a strong competitor during the pine regeneration phase (Haines et al. 1975). This competition can be especially severe on dry sites where wiregrass can significantly reduce pine seedling survival (Scheer and Woods 1959). Numerous mechanical systems have been tested for reducing the amount of wiregrass competition when pine stands are being regenerated. Single treatments with a single drum chopper disturb but do not seriously affect wiregrass (Grelen 1959, Sheer and Woods 1959). Two passes with a double drum chopper, will nearly eliminate the wiregrass component (Grelen 1962) on dry sandhills sites and greatly reduces it on flatwoods sites (Moore 1974). It is similarly reduced on flatwoods sites by other dual mechanical site preparation treatments such as disking and bedding and reduced further by the triple treatment of disking and double bedding (Schultz and Wilhite 1974). Since wiregrass is a key species in the community, land managers need site preparation techniques which only temporarily reduce wiregrass cover. This means limiting the destruction of wiregrass clones or bunches, because reproduction from seed is rare (Clewell 1989). This survey was to gain insight into the impact to wiregrass cover on sandhills sites of different site preparation systems.

Materials and Methods

The study was conducted on the Ocala National Forest located in the central highlands region of Florida, USA. Most of the forest is covered by deep sandy soils from relic dunes formed during the Pleistocene as sea level rose and fell. Sand pine scrub, a mixture of sand pine and shrubby hardwoods with sclerophyllus leaves, is the most prevalent community type on the forest. Within this matrix of sand pine scrub exist islands of longleaf pine growing in open stands with scattered clumps of understory oaks and a ground cover dominated by wiregrass. A portion of this longleaf area on the forest needs restoration to eliminate off site pines, to reduce the hardwood component and to reestablish longleaf pine. Some sites have slash pine

plantations on them, while others have been invaded by sand pine or scrub oaks during a 30 year era of fire exclusion.

All of the 53 sandhills wiregrass - longleaf sites on the forest regenerated between 1985 and 1990 were sampled. Wiregrass cover was assessed during the late summer and autumn of 1990 along 30-m line transects by the line-intercept method (Mueller-Dombois and Ellenberg 1974). A total of 12 transects were established from random starting points in each area. The number of 15-cm segments containing wiregrass were counted and recorded for each transect. Ocala National Forest records were searched to determine date and method of site preparation and method of planting. Wiregrass cover data were also collected from 31 uncut mature natural longleaf stands. These stands were a stratified random sample of all sandhills longleaf stands on the forest greater than 50 years old.

Four study sites had received no site preparation before regeneration (Table 1). Hexazinone was used on 47 of the sites with 22 treated with liquid and 25 with the granular form. The liquid was applied using either a boom sprayer or backpack sprayer while granules were spread with an Omni air spreader. The boom sprayer gives broadcast coverage. A spot gun was used with the backpack sprayer with spots spaced on a 2 meter square grid. Application rates varied from 1 to 2 kg/ha of active ingredient for liquid treatments and from 1.1 to 1.7 kg/ha with the granular form of hexazinone. Ten sites treated with granules and 12 with liquid hexazinone were also given a single pass with a double drum chopper 5 to 6 months following herbicide application. Two sites received no herbicide treatment, but were chopped twice within a 3 to 6 month period. On two areas half of the site was chopped and the other broadcast sprayed with Garlon™ [triclopyr (3,5,6-trichloro-pyridinyloxyacetic acid)] at a rate of 4.5 kg/ha active ingredient. Machine planting was used to establish longleaf seedlings on allregenerated sites. On ten sites a V-blade scalped about a half meter strip during planting.

Table 1. Number of stands and total area by treatment

Treatment	Number of Stands	Area Treated (ha)
Uncut stands	31	735
Harvest only	4	50
Hexazinone liquid	10	210
Hexazinone granular	15	270
Hexazinone liquid & chop	12	190
Hexazinone granular & chop	10	105
Chop & chop	2	30

Table 2. Wiregrass cover by treatment for selected longleaf stands on the Ocala National Forest, Florida.

Treatment	Wiregrass Cover	
	Range	Mean and CI*
	(percent)	
Uncut stands	10-81	42+/-2.1
Harvest only	28-64	47+/-3.2
Hexazinone (liquid)	21-73	42+/-2.3
Hexazinone (granular)	18-68	36+/-1.8
Hexazinone (liquid) and chop	2-67	27+/-2.1
Hexazinone (granular) and chop	1-20	14+/-1.5
Chop and chop	0-1	1+/-0.3

*Mean and the 95 percent confidence interval.

Results and Discussion

There was a considerable range in wiregrass cover (10 to 81 percent) in mature uncut stands (Table 2). Site prepared areas had the same general range of values except the hexazinone and chop and the double chop sites, which both had lower maximum values. The range in wiregrass cover in uncut stands results largely from differences in past burning regimes and location relative to sand pine stands. Areas burned more often have less cover from competing oaks and other shrubs and consequently more wiregrass cover. Stands adjacent to sand pine scrub, have been invaded by sand pine and the shrub understory of that community. Competition from these species will eliminate wiregrass from a significant portion of the site. Thus stands that burned very infrequently and were next to sand pine scrub, now have low wiregrass cover.

Statistical comparisons of site preparation treatments are not valid because most site preparations were not assigned at random. However, comparisons of treatment averages do suggest treatment effects. Areas regenerated without site preparation appear to have the same average wiregrass cover as uncut stands or harvest only areas (Table 2). Sites prepared with liquid hexazinone also appear to have nearly the same cover as untreated stands. It appears the granular form of hexazinone may have caused some decline in wiregrass cover. The average wiregrass cover on areas chopped after spraying with liquid hexazinone was less than for uncut stands. Stands

treated with granular hexazinone and then chopped now have only about one third the wiregrass cover of uncut stands. Only two sites had been double chopped, but both now have very little wiregrass cover.

It appears liquid hexazinone applied at the rates and by the methods used here should not adversely impact wiregrass cover on sandhills wiregrass - longleaf sites. Individual wiregrass bunches have responded to the reduction in competition, as they would following a fire, and have flowered abundantly. The small apparent decline with granular hexazinone agrees very closely with the estimated 5 percent loss in wiregrass noted by Duever (1989). Vegetative reproduction of wiregrass should be able to replace this small decline in cover. Also this is a one time herbicide treatment to reduce competing oaks, which can then be easily maintained with prescribed fire.

This does not mean hexazinone will not kill wiregrass. At higher rates, which can occur if application strips overlap, mortality may be higher (Duever 1989). This can be avoided by using spot gun applications which virtually eliminate overlap. The lower application rate of 1.1 kg/ha appears adequate for competition control and should be favored.

Since liquid hexazinone alone caused no decline in wiregrass cover, chopping after herbicide treatment must have caused the wiregrass mortality. The magnitude of the present difference in wiregrass cover, between chopped and uncut sites, is comparable to the 23 percent decline from chopping alone reported for a west Florida sandhills site (Outcalt and Lewis 1990). The combined effect of granular hexazinone and chopping also appears harmful to wiregrass. Thus, even a single pass with a double drum chopper should be avoided on sandhills sites which contain wiregrass. As shown previously (Outcalt and Lewis 1990) two passes with a double drum chopper will nearly eliminate wiregrass from the site.

Only two sites were treated with Garlon but it was done so statistical comparisons could be made. Both sites had a lot of oak competition before treatment, and thus low wiregrass cover. Two years after site preparation the Garlon treatments had 18 percent wiregrass cover while the chopped treatments had significantly less at 6 percent (s.e of 2.63). As with hexazinone, chopping was much more detrimental to wiregrass than the herbicide. Further study is needed comparing wiregrass cover before and after treatment with Garlon before wide scale use can be recommended.

Conclusion

With selective herbicides, sandhills sites can be site prepared and planted to longleaf pine without adversely impacting the critical species wiregrass. If the site has a heavy invasion of sand pine (Figure 1a), it should first be prescribed burned. Prescribed burning should be followed by a spring application of liquid hexazinone at a rate of 1 to 1.5 kg/ha active ingredient. Herbicide should be applied with a spot gun with spots spaced on a 2 meter grid. This treatment will reduce woody competition without materially damaging the wiregrass (Figure 1b). Sites can then be planted with machine or by hand (Figure 1c). This should result in a good stand of longleaf seedlings and an abundant cover of wiregrass three to four years after planting (Figure 1d). Any sand pine seedlings in the stand can be mechanically removed using brush saws. In a few years when the longleaf are large enough, a prescribed fire carried by the wiregrass will reduce oak sprouts and other woody competition. From this point forward a fire cycle of 3 to 5 years with the majority during the growing season will mimic the natural fire regime, restrict sand pine invasion, keep woody competition in check and help maintain the vigor of the wiregrass ground cover.

Boyer, W. D. 1975. Development of brown-spot infection in longleaf pine seedling stands. USDA For. Serv. Res. Pap. SO-108, South. For. Exp. Stn., New Orleans, LA., 10p.

Christensen, N. L. 1981. Fire regimes in southeastern ecosystems. In Fire Regimes and Ecosystem Properties, USDA For. Serv. Gen. Tech. Rep. WO-26, p112-135.

Clewell, A. F. 1989. Natural history of wiregrass (*Aristida stricta* Michx., Gramineae). Natural Areas J., 9:223-233.

Duever, L. C. 1989. Research priorities for the preservation, management, and restoration of wiregrass ecosystems. Natural Areas J., 9:214-218.

Eyre, F. H. 1980. Forest cover types of the United States and Canada. Soc. Am. For., Washington, DC, 148p.

Grelen, H. E. 1959. Mechanical preparation of pine planting sites in Florida sandhills. Weeds 7:184-188.

Grelen, H. E. 1962. Plant succession on cleared sandhills in northern Florida. Am. Midl. Nat., 67:36-44.

Haines, L. W., Maki, T. E., and Sanderford, S. G. 1975. The effects of mechanical site preparation treatments on soil productivity and tree (*Pinus taeda* L. and P. *elliottii* Engelm. var. *elliottii*) growth. In Forest Soils and Forest Land

Management. Laval Univ. Press, Quebec, p379-395.

Komarek, E. V., Sr. 1977. Tall Timbers Research Station, a quest for ecological understanding. Tall Timbers Res. Stn. Misc. Publ. 5, 140p.

Moore, W. H. 1974. Some effects of chopping saw-palmetto-pineland threeawn range in south Florida. J. Range Management 27(2):101-104.

Mueller-Dombois, D., and Ellenberg, H. 1974. Aims and Methods of Vegetation Ecology. John Wiley & Sons, NY 547pp.

Outcalt, K. W. and Lewis, C. E. 1990. Response of wiregrass (*Aristida stricta*) to mechanical site preparation. In:L.C. Duever and R.F. Noss (Editors), Wiregrass biology and management, Symp. Proc., Oct. 13, 1988, Valdosta, GA., KBN Engineering & Applied Sciences, Gainesville, FL., 12p.

Scheer, R. L. and Woods, F. W. 1959.Intensity o preplanting site preparation required fo Florida's sandhills. USDA For. Serv. Occas *Pap. 168. South. For. Exp. Stn., 12p.*

Schultz, R. P. and Wilhite, L.P. 1974.Changes in flatwoods site following intensive preparation For. Sci. 20:230-237.

Snedaker, S. C. and Lugo, A. E. 1972. Ecology of th Ocala National Forest. USDA For. Serv South. Reg. Publ. 24, 211p.

Southern Section, Society of Range Management. 1974 Range resources of the South. Georgia Agric Exp. Stn., Univ. Georgia, College of Agric Athens. Bull. N.S. 9, 33p.

Figure 1. Adjacent sandhills areas on the Ocala National Forest, Florida, at different stages of restoration with hexazinone. (a) Two months after August prescribed burn. (b) Five months after May application of hexazinone by spot gun. (c) Six months after May hexazinone treatment and 2 months after V-blade planting of longleaf seedlings. (d) Four years after hexazinone and planting operations.